

## Written Evidence Submitted by UK Research and Innovation (UKRI) (C190073)

1. **UK Research and Innovation (UKRI)** operates across the whole of the UK with a combined budget of more than £8 billion, bringing together the seven research councils, Innovate UK and Research England.
2. Our **vision** is for an outstanding research and innovation system in the UK that gives everyone the opportunity to contribute and to benefit, enriching lives locally, nationally and internationally. Our mission is to convene, catalyse and invest in close collaboration with others to build a thriving inclusive research and innovation system, that connects discovery to prosperity and public good.
3. UKRI welcomes the Committee's inquiry and its ongoing work meeting with leading researchers and public health officials working on the response to the COVID-19 pandemic in the UK and internationally. Our submission to this inquiry provides an overview of UKRI's response to the pandemic, from launching rapid response calls to shifting existing resources, capabilities and expertise to focus on COVID-19 research. While our submission highlights several research projects most relevant to the inquiry, there are many more examples to draw upon beyond what we have captured in our written evidence.

### **Summary**

4. UK's research and innovation is pivotal in the fight against COVID-19, and in leading the recovery from the global crisis. UKRI responded quickly to rapidly deploy funding for research to tackle the emergence of COVID-19 and has already allocated £70m to new research and innovation projects in institutes, businesses and universities across the UK. In addition to this, more than £81m worth of existing UKRI grants have been partially or totally repurposed to focus on contributing to the national effort. This does not include funding to stabilise the research base or to assist businesses. This additional support builds upon sustained previous investment in infectious disease research and the development of testing, diagnostics, therapeutics and vaccines, as well as social science of relevance to public health designed to underpin the UK's world leading position, helping us to grow and retain world-leading talent, expertise and capacity.
5. The impact of COVID-19 is vast and varied, complex and evolving. Researchers and innovators need to address a spread of issues related to COVID-19 and the global pandemic including major disruptions to the global economy, mental health concerns during an unprecedented lockdown, and changes to the environment. Along with progressing our understanding of COVID-19, its biological mechanisms, diagnostics and treatment, research is crucial to understand the economic, social, psychological, and environmental impacts of the pandemic on society. For this reason, UKRI's rapid response funding touches on all research disciplines and includes delivery from multiple research councils, including funding for SMEs and wider industry research addressing these issues and our international work to tackle COVID-19 on a global scale.
6. UKRI's quick mobilisation to provide rapid response funding and the overwhelming response from the research community has demonstrated the value of the well-established research base we have in the UK and its ability to rise to new challenges with innovative solutions at an impressive speed. UKRI-funded research has made major contributions to progressing the UK's understanding of the spread of COVID-19 across the country, its impact on society, and efforts in the development of diagnostics, therapeutics and vaccines. It is this strong research base, connected under the UKRI umbrella, that has allowed us to respond so rapidly and effectively to

this crisis.

**Q1: The contribution of research and development in understanding, modelling and predicting the nature and spread of the virus**

7. Research into COVID-19, its pathology, spread, prevention and control has been critical to understanding the global pandemic. UKRI has played a crucial role in bringing together academics, industry and policymakers, to bring an impressive breadth of research and development expertise in understanding the nature and spread of infectious diseases to bear on this new pathogen.
8. UKRI has introduced several funding calls including:
  - A joint UKRI-DHSC rapid response initiative<sup>1</sup> including two calls (£24.6m awarded across 27 projects, including testing for a vaccine, developing therapies and improving understanding of how to treat COVID-19), and a rolling response call<sup>2</sup> to deliver public health impacts.
  - A UKRI call for short-term (12-18 month) projects from UK-led academic, SME and wider industry research addressing and mitigating the health, social, economic, cultural and environmental impacts of the COVID-19 outbreak.
  - A UKRI Global Challenges Research Fund(GCRF)/Newton Fund Agile response call<sup>3</sup> for short-term projects addressing the impacts of COVID-19 on Low- and Middle-Income Countries (LMICs).

In addition to these, but not directly targeted at research into the virus, UKRI has made further investments to maintain the stability of the R&D system, including £750m provided by Innovate UK to support R&D intensive SMEs, and structural investments, such as costed grant extensions and reprofiling by Research England of £100m of quality-related (QR) funding to support universities to address short-term pressures.

9. Key to the response to global disease outbreaks is a strong foundation in research and development with existing expertise and capacity for research which can be rapidly adapted to current needs. For example, in the two decades before the crisis UKRI and its predecessors had invested more than £78m in projects that were related to coronavirus research but not COVID-19 specifically. As well as the new funding calls outlined above, UKRI has been making long-term investments in Institutes, Units and Centres to form national centres of scientific expertise. Many of these have redirected their capabilities and expertise to conduct research on the COVID-19 pandemic. Examples include:
  - The Medical Research Council (MRC) Centre for Global Infectious Disease Analysis<sup>4</sup>, which has been at the forefront of delivering timely analysis to inform policy responses to emerging infectious disease threats. The Centre was awarded an additional £0.5m to support their real-time analysis and modelling of the COVID-19 pandemic.
  - The MRC Centre for Virus Research at the University of Glasgow<sup>5</sup>, working in collaboration

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<sup>1</sup> <https://mrc.ukri.org/funding/browse/2019-ncov-rapid-response-call/2019-ncov-rapid-response-call/>

<sup>2</sup> <https://mrc.ukri.org/funding/browse/ukri-nihr-COVID-19/ukri-nihr-COVID-19-rolling-call/>

<sup>3</sup> <https://www.ukri.org/funding/funding-opportunities/ukri-gcrf-newton-fund-agile-response-call-to-address-COVID-19/>

<sup>4</sup> <https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/COVID-19/>

<sup>5</sup> <https://www.gla.ac.uk/researchinstitutes/iii/cvr/>

with NHS Greater Glasgow, completed the genomic sequencing and analysis of Scotland's first confirmed COVID-19 case within 48 hours of diagnosis.

- The Rosalind Franklin Institute<sup>6</sup>, funded through the Engineering and Physical Sciences Research Council (EPSRC), have led a collaborative project with Protein Production UK, resulting in the isolation of nanobodies which bind to the spike protein of the SARS-CoV-2 virus. This has enabled world-leading imaging capabilities of the virus at atomic scale using advanced imaging techniques.
  - The Pirbright Institute<sup>7</sup>, funded by the Biotechnology and Biological Sciences Research Council (BBSRC), undertakes research on coronaviruses (including those with zoonotic potential) which focuses on designing sustainable methods for controlling infectious diseases in livestock.
  - The MRC Biostatistics Unit in Cambridge is developing the methodology for real-time tracking of the COVID-19 pandemic - or "nowcasting"<sup>8</sup>. Working closely with Public Health England (PHE), the researchers are using a transmission model, data on daily COVID-19 confirmed deaths and the time from infection to death, to reconstruct the number of new COVID-19 infections over time. This has helped to estimate a measure of ongoing transmission (R); and predict the number of new COVID-19 deaths in different regions and age groups to help inform the public health response to the outbreak.
  - The Economic and Social Research Council (ESRC) Centre for Society and Mental Health<sup>9</sup> has published a rapid evidence review<sup>10</sup> showing that social isolation in response to public health crises has the greatest mental health impact on the vulnerable and the disadvantaged. The Network for Integrated Behavioural Science<sup>11</sup> at the University of Nottingham is running multiple projects including work on the impact of messages to promote conformity with social distancing recommendations.
  - To support COVID-19 research in LMICs, additional support has been provided to the MRC units in Uganda<sup>12</sup> and the Gambia<sup>13</sup> towards sequencing the SARS-CoV2 genome in the region, research on psychological impacts of infection and a clinical trial of potential therapeutics.
10. Projects funded through the calls listed above that are helping to understand, model and predict the nature and spread of the virus include:
- **Clinical characterisation and management:** Professors Peter Openshaw, Imperial College London, Calum Semple, University of Liverpool and Kenneth Baillie, University of Edinburgh, received a £4.9m grant to collect samples and data from COVID-19 patients in the UK to answer many urgent questions about the virus and provide real-time information to help control the outbreak and improve treatment for patients.
  - **Impact on society and the health system:** Professor Carol Propper, Imperial College London, is conducting research looking at the impacts of COVID-19 on the provision of NHS

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<sup>6</sup> <https://www.rfi.ac.uk/>

<sup>7</sup> <https://www.pirbright.ac.uk/covid19>

<sup>8</sup> <https://www.mrc-bsu.cam.ac.uk/now-casting/>

<sup>9</sup> <https://www.kcl.ac.uk/research/centre-for-society-mental-health>

<sup>10</sup> <https://esrc.ukri.org/files/news-events-and-publications/evidence-briefings/impacts-of-social-isolation-among-disadvantaged-and-vulnerable-groups-during-public-health-crises/>

<sup>11</sup> <https://www.behavioural-science.ac.uk/>

<sup>12</sup> <https://www.mrcuganda.org/>

<sup>13</sup> <https://www.mrc.gm/>

health care and patient outcomes, providing a detailed description of the extent to which non-COVID-19 NHS activity has been affected. Professor Richard Bentall is conducting a longitudinal mixed-methods population study of the UK to examine changes to mental health and psychosocial functioning from the beginning to the end of the pandemic. Dr Claire Smith at UCL is also determining age dependent factors driving COVID-19 disease severity.

- **Epidemiological studies:** Professor Andrew Hayward, University College London, received £3.2m for his team's 'Virus Watch'<sup>14</sup> study of 25,000 individuals across the UK in a nationally representative household cohort. Dr Eleni Nastouli, UCL, received £1.5m to test healthcare workers<sup>15</sup> at UCL NHS Foundation Trust for COVID-19 repeatedly over time to assess the risk of acquiring the infection.
- We will further discuss the rapid response calls and point to examples of research projects throughout our submission.

## **Q2: The capacity and capability of the UK research base in providing a response to the outbreak in terms of:**

### ***Advice to government, public bodies and others on managing the outbreak***

11. The committee has heard much on the structures in place within government for gathering and directing expert advice to policymakers to inform decision-making. The UK has a strong culture of researchers engaging with policy development with many resources in place to help researchers develop the understanding and influencing skills needed, including initiatives such as the UKRI Policy internship scheme<sup>16</sup> and training courses run by institutions such as the Royal Society and Wellcome Trust.
12. During the current COVID-19 crisis, UKRI has been involved in many of the mechanisms the government has been using to gather expert advice. Former UKRI Chief Executive Sir Mark Walport was invited to join SAGE by Sir Patrick Vallance on 16 April to ensure questions the group raised could be directly actioned in research. The first meeting he joined was on 21 April. UKRI was also part of the Independent Scientific Pandemic Influenza Group on Behaviours<sup>17</sup> (SPI-B), which is providing advice aimed at helping people adhere to interventions recommended by medical and epidemiological experts. UKRI has drawn from these groups to gather advice on where we should be concentrating our resources, for example in the development of the list of priority areas and research questions<sup>18</sup> defined by research councils that have been published against the UKRI open call for research projects. SAGE, Chief Scientific Advisors, and the Government Office for Science have contributed to the current list, which is intended to evolve over time as gaps are identified and priorities emerge.

### ***The development of testing, diagnostic methods and technologies; the development and testing of vaccines; and the development and testing of therapeutics***

13. Progress in developing accurate diagnostic technology, the international efforts to develop a viable vaccine, and ongoing work to uncover effective therapeutics has captured the attention and

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<sup>14</sup> <https://www.ucl.ac.uk/news/2020/jun/new-study-COVID-19-transmission-and-immunity-launched>

<sup>15</sup> <http://www.uclh.nhs.uk/News/Pages/UCLHresearchstudysuggestsawaystoreduceCOVID-19infectionsinhospitals.aspx>

<sup>16</sup> <https://www.ukri.org/skills/policy-internships-scheme/>

<sup>17</sup> <https://www.gov.uk/government/groups/independent-scientific-pandemic-influenza-group-on-behaviours-spi-b>

<sup>18</sup> <https://www.ukri.org/files/research-questions-for-COVID-19/>

efforts of the global scientific community, pharmaceutical companies and international public health officials in response to the ongoing pandemic. Through a combination of existing major investments, such as the UK Vaccine Network, two Vaccine Manufacturing Hubs delivered by EPSRC, and rapid response call funding, UKRI has remained committed to funding and furthering research that addresses the need for diagnostics, therapeutics and vaccines to help in the fight against the COVID-19 pandemic and the risk of other infectious disease outbreaks.

### ***The development of testing, diagnostic methods and technologies***

14. Early detection and accurate diagnostic technologies are crucial to protect populations from disease and to help patients gain faster access to care. The importance of this is reflected in UKRI long-term grants and rapid response call awards with examples that include:

- i-sense<sup>19</sup>, which received £11m from EPSRC in 2013 followed by a subsequent £4m, to develop digital health systems to test, track and treat infections. The i-sense team, led by Professor Rachel McKendry at UCL, are tackling early identification of COVID-19 in the community through utilisation of online data sources and point-of-care diagnostics.
- The COVID-19 Protein Portal<sup>20</sup>, an initiative led by Wellcome and MRC, which allows UK scientists to access protein reagents needed for critical research relating to SARS-CoV-2 from a consortium of leading protein production laboratories. MRC-funded Institutes including the Francis Crick Institute and the MRC Laboratory of Molecular Biology are partners in the Protein Production Consortium.
- The ESRC-funded COVID-19 international comparative research and rapid knowledge exchange hub on diagnostic testing systems<sup>21</sup> at the University of Sussex is identifying the key elements of testing systems that have contributed to effective performance, including measures taken that have facilitated preparedness and resilience before the crisis as rapid innovations that have helped countries deal with a fast-evolving pandemic.
- COVID-19 National DiagnOstic Research and Evaluation Platform<sup>22</sup> (CONDOR) which is receiving £1.3m in partnership with DHSC to create a single national route for evaluating new diagnostic tests in hospitals and in community healthcare settings.
- Funding from the Natural Environment Research Council (NERC) has supported three groups led by the UK Centre for Ecology and Hydrology<sup>23</sup>, and Bangor and Imperial universities<sup>24</sup>, who are working in tandem with the UK government Joint Biosecurity Centre and water companies to detect and trace COVID-19 in the human population using proxy measurements of its prevalence in wastewater and its receiving waters<sup>25</sup>.

### ***The development and testing of vaccines***

15. Recognising the importance of vaccination to attenuate disease outbreaks, UKRI has a history

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<sup>19</sup> <https://www.i-sense.org.uk/about-i-sense/about-EPSRC>

<sup>20</sup> <https://covid19proteinportal.org/>

<sup>21</sup> <http://www.sussex.ac.uk/spru/research/projects/diagnostic-testing>

<sup>22</sup> <https://www.phc.ox.ac.uk/COVID-19/projects/COVID-19-national-diagnostic-research-and-evaluation-platform-condor>

<sup>23</sup> <https://www.ceh.ac.uk/press/work-begins-uk-system-estimating-covid-19-cases-wastewater>

<sup>24</sup> <https://www.imperial.ac.uk/news/198554/mapping-coronavirus-sewage-could-reveal-disease/>

<sup>25</sup> <https://www.gov.uk/government/news/group-to-measure-for-coronavirus-prevalence-in-waste-water>

of providing support across the vaccine development pathway for key infectious diseases which pose a global health risk. The MRC supports early stage vaccine work through its translational funding programmes, while the MRC and BBSRC provide strategic support for early vaccine development through GCRF vaccine networks (a £12.4m investment across five networks), which seek to address gaps in discovery and experimental medicine stages.

16. UKRI, through Innovate UK, has established the £131m Industrial Strategy Challenge Fund Vaccines Manufacturing Innovation Centre (VMIC)<sup>26</sup>. VMIC progresses the development and manufacture of vaccines for clinical trials and at moderate scale for emergency preparedness for epidemic threats to the UK population.
17. For later stage vaccine development, UKRI is providing support for the DHSC-led £120m UK Vaccine Network (UKVN)<sup>27</sup> established in 2015, which brings together industry, academia and relevant funding bodies to make targeted investments in specific vaccines and vaccine technology for 12 priority diseases with the potential to cause an epidemic. Previous UKVN awards granted for the development of MERS vaccines have now enabled vaccine development groups to hit the ground running with new funding from the joint DHSC/UKRI COVID-19 rapid response call. Two research projects that have attracted international media attention include:
  - An award to the MRC's Human Immunology Unit to undertake a Phase 1 clinical trial of a ChAdOx1 MERS vaccine, from University of Oxford Professor Sarah Gilbert's lab in collaboration with international partners. This initial work has provided the basis for the rapid development of the Oxford SARS-CoV-2 vaccine<sup>28</sup> – a research project now receiving £2.2m in DHSC/UKRI rapid response call funding. Preliminary results are showing that a promising immune response is elicited by the vaccine.
  - An award to Imperial College London Professor Robin Shattock<sup>29</sup> to establish a new self-amplifying RNA (saRNA) platform that can be rapidly tailored to new disease threats. This platform is now being deployed to develop the Imperial SARS-CoV-2 vaccine, supported by £1.8m in DHSC/UKRI rapid response call funding.
18. Furthermore, Innovate UK is delivering £75m in funding, on behalf of DHSC, for the Small Business Research Initiative (SBRI)<sup>30</sup> Vaccines for Emerging Epidemics programme. 53 projects were initially funded to develop new vaccines and technologies to tackle diseases with epidemic potential, such as Zika, Ebola, and Hanta. 20 projects have been helping advance vaccine technologies that have played an important role in the response to the COVID-19 pandemic.
19. Working in collaboration with researchers at the University of Oxford and PHE, researchers at the Pirbright Institute<sup>31</sup> are contributing to vaccine development by testing new COVID-19 vaccines on animal models to determine their ability to induce protective antibodies.

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<sup>26</sup> <https://www.ukri.org/news/uks-first-ever-vaccines-manufacturing-centre-aims-to-tackle-deadly-diseases/>

<sup>27</sup> <https://www.gov.uk/government/groups/uk-vaccines-network>

<sup>28</sup> <https://covid19vaccinetrial.co.uk/>

<sup>29</sup> <https://www.imperial.ac.uk/news/196775/coronavirus-vaccine-team-secures-funding-move/>

<sup>30</sup> <https://www.gov.uk/government/collections/sbri-the-small-business-research-initiative>

<sup>31</sup> <https://www.pirbright.ac.uk/news/2020/06/studies-pirbright-demonstrate-two-doses-oxford-university%E2%80%99s-COVID-19-vaccine-boosts>

20. Assuming a COVID-19 vaccine becomes available in the future, health officials need to prioritise public confidence in the vaccine to ensure broad uptake. ESRC is funding research that will collect and analyse data on public attitudes towards a COVID-19 vaccine to identify the facilitators and barriers to vaccine uptake and work constructively with policymakers to develop effective vaccination campaigns that meet information needs, and counters misperceptions and misinformation.

### ***The development and testing of therapeutics***

21. Long-term strategic investments in clinical research facilities and infrastructure have provided the capacity in the UK to undertake research in candidate therapeutics. Universities, hospitals and industry have been key to enabling the rapid start for research. The MRC Clinical Trials Unit, for example, played a role in the Adaptive COVID-19 Treatment Trial<sup>32</sup>, which showed reduced hospital stay for patients treated with remdesivir. Having established protocols in place has also been important for the rapid start of research specific to the current pandemic. Further examples of UKRI funding for therapeutics development include:

- MRC support for the establishment of ISARIC – the International Severe Acute Respiratory and Emerging Infection Consortium<sup>33</sup> – which has provided the basis for the RECOVERY Trial. RECOVERY<sup>34</sup> was supported by a £2.1m DHSC/UKRI rapid response award to Professor Peter Horby, University of Oxford. It is the biggest trial in the world and has proved the case for dexamethasone and disproved the case for other treatments.
- ACCORD (Accelerating COVID-19 Research & Development platform)<sup>35</sup>, led by former UKRI Chief Executive Sir Mark Walport and delivered by the MRC, is one of a suite of PHASE II trial platforms (that also include CATALYST, TACTIC AND DEFINE) UKRI is coordinating that aims to get an early indication of drug treatments' effectiveness in treating coronavirus. If positive results are seen, these drugs will advance rapidly into the large-scale trials currently in progress across the country, such as the RECOVERY trial. It is reducing the time taken to set up clinical studies from months to just weeks.

### **Q3. The flexibility and agility of institutions, Government departments and public bodies, and processes to respond appropriately during the crisis including:**

#### ***The availability and responsiveness of funding***

22. UKRI responded quickly to deploy rapid response funding for research to tackle the emergence of COVID-19 and has allocated £70m to new research and innovation projects. The rapid response calls and interventions that have been launched to tackle the crisis have received an impressive response from the R&D community, demonstrating the value of the well-established and supported research and innovation infrastructure that we have in the UK and its ability to rise to new challenges at speed. For example, the UKRI open call for short-term projects addressing and mitigating the health, social, economic, cultural, and environmental impacts of the outbreak has been receiving an average of over 200 high-quality applications each week since its launch. The UKRI GCRF/Newton Agile Response call to support projects addressing COVID-19 health, social, economic and cultural and environmental impacts in LMICs has received applications involving more than 50 countries.

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<sup>32</sup> <https://www.ukri.org/news/preliminary-results-of-COVID-19-drug-treatment-trial-found-to-improve-recovery/>

<sup>33</sup> <https://isaric.tghn.org/>

<sup>34</sup> <https://www.ukri.org/news/preliminary-trial-results-dexamethasone/>

<sup>35</sup> <https://www.hra.nhs.uk/planning-and-improving-research/application-summaries/research-summaries/agile-accord-accelerating-COVID-19-drug-development-COVID-19-uph/>

23. UKRI has drawn on its strategic international partnerships to ensure UK researchers have access to relevant funding opportunities to respond to COVID-19. For example, UKRI recently oversaw a fast-paced coordinated agreement with the Japan Science and Technology Agency that made funding available for Japan-based researchers and UKRI-funded researchers to work together.
24. Prior to the pandemic, UKRI was undertaking a programme of work called Reforming our Business (RoB) with the dual aims of reducing bureaucracy in UKRI's grants processes to free up researchers and innovators applying to UKRI and enabling the expertise of UKRI's Councils to focus on deep community engagement. The need to move quickly on rapid response funding for COVID-19 research and innovation has led to UKRI testing new, agile processes while ensuring that taxpayer money is being used to effectively support the highest quality research and innovation. The team leading the RoB programme are evaluating our work on COVID-19 to ensure that we capture lessons learnt to improve UKRI's response to future emergent research challenges and deliver on the dual aims of the RoB programme.
25. UKRI councils were also able to adapt existing infrastructure and funding calls in response to the pandemic. For example, the Science and Technology Facilities Council (STFC) Central Laser Facility recognised the potential of its Octopus microscopy cluster to assist researchers working on COVID-19 and put into place a rapid response light touch peer-review access mechanism three days after the UK national lockdown. In addition, in March 2020, NERC directed its Urgency grant scheme<sup>36</sup> to call for ideas focused on the immediate, unexpected and transient environmental research opportunities created by unpredictable natural events in light of COVID-19. NERC also invited Highlight Topic ideas (strategic funding for research) to encourage environmental solutions that learn from the pandemic, to help the UK environment, economy and society recover from COVID-19 legacy challenges.

### ***The optimal functioning of regulatory and ethical processes***

26. In response to the need to speed up regulatory processes, the Health Research Authority (HRA)<sup>37</sup> has implemented measures to support fast-track ethics approval for research on COVID-19 while also ensuring that reviewing is not superficial. These changes meant that Professor Peter Horby's research, mentioned in Q2, was able to recruit 10,000 patients in 176 hospitals within two months for the clinical trial to test if new or existing drugs can help hospitalised patients.
27. The urgent need for key health technology products paired with global supply issues for these scarce resources – PPE, invasive ventilators, syringe drivers – led to innovative regulatory approaches from the Medicines and Healthcare Products Regulatory Agency (MHRA) and the Health and Safety Executive (HSE) that enabled non-CE marked products to undergo robust review processes resulting in temporary exemptions from the regulations.
28. A shortfall of critically-needed invasive ventilators led MHRA to develop the Rapidly Manufactured Ventilator System (RMVS) Challenge. It typically takes 18 months to gain a CE mark for a ventilator but through RMVS, MHRA has been able to provide a mechanism that has enabled products to be carefully scrutinised and authorised for exceptional use within 2 weeks. Innovate UK staff worked closely with MHRA to develop and implement the regulatory approach and ensure that projects had access to regulatory and clinical support.
29. The High Value Manufacturing Catapult, funded through Innovate UK, led the Ventilator Challenge UK<sup>38</sup> coalition that scaled up production of the Penlon ES02 and Smiths paraPAC

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<sup>36</sup> <https://nerc.ukri.org/funding/application/currentopportunities/announcement-of-opportunity-urgency-grants-related-to-the-current-coronavirus-outbreak/>

<sup>37</sup> <https://www.hra.nhs.uk/COVID-19-research/>

ventilators with delivery of the first device on 15 April just weeks after the government first put out the call to the UK manufacturing industry to help design, build and manufacture ventilators on 16 March.

**Q4. The capacity to manufacture and distribute testing, diagnostics, therapeutics and vaccines in both standing capacity and capacity able to be mobilised**

30. Businesses often rely on resource from overseas to assemble at least some components of their devices, consumables or reagents needed for diagnostic kits. The pandemic has led to a re-evaluation of the supply chain and, including capability for ultra-high capacity manufacturing, for example to satisfy the demand for LFA (Lateral Flow Assay) antibody tests. We need to apply this momentum to build and maintain more flexible and robust capacity in the UK, for example through the wider application of digital twinning approaches to model and continuously improve processes.
31. Through the investments that UKRI has made over the last few years the UK has a globally unique capability in that it has a suite of Innovation, Scale up and Demonstrator assets that cover the whole range of Medicines Manufacturing.

<b>MEDICINE TYPE</b>	<b>Manufacturing Innovation Infrastructure</b>
ATMPs (Cell and Gene Therapy)	Cell and Gene Therapy Manufacturing Centre CGTMC
Biologics	National Biologics Manufacturing Centre NBMC
Vaccines	Vaccines Manufacturing Innovation Centre VMIC
Oral solid dose	Medicines Manufacturing Innovation Centre MMIC
Pharmaceutical Formulation	National Formulation Centre NFC

32. The infrastructure, set up to be agile and scalable, is either on the ground now or will be completed soon but the capabilities and expertise already exist in these teams. The UK's response to the pandemic would not have been possible without access to this wide-ranging expertise. This capability has underpinned the UK's response to the challenges of establishing a vaccines manufacturing supply chain for the UK's experimental vaccines through rapid modification of assets such as the National Biologics Manufacturing Centre, which will be the site of manufacture of Imperial College London's (Professor Robin Shattock's research noted in Q2) self-replicating mRNA vaccine.
33. The Future Vaccine Manufacturing Hub, supported by DHSC and EPSRC, directly links with the Developing Countries Vaccine Manufacturers Network (DCVMN)<sup>39</sup> and is specifically looking at issues for LMICs for future COVID-19 vaccination programmes. In parallel, the UKRI Rapid Response call has funded a project by Professor Nilay Shah at Imperial College London, which is designing a blueprint to ramp up and ensure uninterrupted delivery of COVID-19 vaccines in the UK.
34. Continued investment in these centres and ongoing work to ensure coordination to further develop flexible, agile and scalable medicines manufacturing technologies in the UK will continue

<sup>38</sup> <https://www.ventilatorchallengeuk.com/>

<sup>39</sup> <https://www.dcvmn.org/>

to underpin the UK medicines manufacturing capability. It will also drive economic growth and attract a wider medicines manufacturing ecosystem to the UK which will provide a stronger base from which to respond to future healthcare challenges.

#### **Q5. The capturing during the crisis of data of the quantity and quality needed to inform:**

##### ***Decisions made during the crisis; and to maximise the learnings afterwards***

35. UKRI-funded Health Data Research UK (HDR UK)<sup>40</sup>, the national institute for health data science, has been actively championing the use of health data to address the COVID-19 challenge. Current work at HDR UK includes research on risk factors, genomics, clinical trials, care pathways and surveillance while forging partnerships with government, NHS, industry and academia. HDR UK are also implementing a prioritisation system to ensure that resources are appropriately directed to where they are needed. This strategy will ensure that the best of the UK's health data science capability will be leveraged to address the COVID-19 pandemic, accelerate access to UK-wide priority datasets, and coordinate and connect a national data science-driven research effort across the UK.
36. COVID-19 has temporarily eased some of the challenges around access to and linkage of NHS data with research data through the Control of Patient Information (COPI) notice. Exemptions to the laws around data sharing and speeding up the approval and access processes have vastly facilitated access to health data for research. However, the barriers are many, and complex, and it hasn't been made clear how this data needs to be handled once the exemptions expire.
37. Major investments by ESRC in a range of high-quality data have enabled researchers to step-up rapidly to support the national response. Administrative Data Research (ADR UK)'s investment in linking administrative data across departments in the secure research service, in partnership with the Office for National Statistics, ensured access remained securely open when researchers were forced to work away from their offices, enabling them to respond to urgent requests in providing analysis on the developing crisis.
38. Digital infrastructure is needed to share and link data. However, this is not currently in place which makes sharing de-identified/population level data challenging. To help overcome this, HDR UK have convened a number of organisations to fund the International COVID-19 Data Alliance<sup>41</sup>.
39. The Alan Turing Institute, funded through EPSRC, has undertaken the DECOVID project<sup>42</sup>, which is a collaboration with NHS Trusts (UCLH and UHB), HDR UK, and a range of academic partners. The collaboration aims to use near real-time health data as the pandemic unfolds to allow researchers and clinicians to identify factors and generate insights that can lead to more effective clinical treatment strategies.
40. The EMBL-EBI, bioinformatics data infrastructure funded by BBSRC, launched the COVID-19 data portal<sup>43</sup> to enable sharing and analysis of COVID-19 data generated across the world. The initiative supports global collaboration on COVID-19 and will help accelerate the development of diagnostics, treatments and vaccines.

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<sup>40</sup> <https://www.hdruk.ac.uk/COVID-19/>

<sup>41</sup> <https://www.hdruk.ac.uk/news/partners-join-forces-to-establish-an-international-alliance-to-enable-secure-and-collaborative-COVID-19-data-research-at-scale/>

<sup>42</sup> <https://www.turing.ac.uk/research/research-projects/decovid>

<sup>43</sup> <https://www.ebi.ac.uk/about/news/press-releases/embl-ebi-launches-COVID-19-data-portal>

41. In July 2020, HDR UK worked with partners to establish a new International Data Research Alliance and Workbench to provide a secure environment for collaborative research, matching data from many sources with cutting-edge analysis to accelerate the development of treatments to combat COVID-19. It will connect to regional or national data infrastructures used by its members, such as the national BREATHE health data research hub in the UK.
42. ESRC has made major investments in capturing high-quality data on COVID-19 which will help to maximise learning afterwards. The Centre for Longitudinal Studies at UCL is undertaking nationwide surveys of participants of five national longitudinal cohort studies to examine the impact of the pandemic, help understand how people at different life stages are affected, and how prior life experiences shape resilience or vulnerability. Understanding Society, the UK Household Longitudinal Study<sup>44</sup> which began in 2009 and interviews around 40,000 households each year, almost immediately entered the field with a representative sample that is informing researchers about the impacts of the lockdown, changes to the economy and social relations and will continue to provide insight into the future.

**Q6: The mechanisms for communication of scientific evidence internationally, within national governments and with the public including the handling of conflicting scientific opinions**

43. UKRI's early objective was to ensure scientific evidence around COVID-19 was communicated effectively to the public, complementing other channels such as PHE's guidance, as we recognised early the risks of misinformation and conflicting advice on public health and safety. UKRI therefore launched the Coronavirus Explained<sup>45</sup> website in March 2020 to provide authoritative and up-to-date explanations of the scientific evidence behind the COVID-19 pandemic to the UK public. The website is supported by the Government Office for Science, DHSC, and the National Institute for Health Research.
44. Throughout the lockdown, then UKRI CEO Sir Mark Walport undertook many media interviews, primarily for national broadcast media such as Sky News, BBC Radio Four's Today Programme and BBC Five Live. In these interviews he outlined UKRI's funding and support, such as vaccine research and our contribution to the ventilator challenge.
45. ESRC is funding a University of Exeter study, which is considering COVID-19 misinformation exposure and messaging effects in the UK, including whether inaccurate information and conspiracy thinking can be effectively countered by informational interventions. The Arts and Humanities Research Council (AHRC) is funding another two studies in this area at Leeds and Manchester. The Leeds research includes a weekly tracker to analyse how changing messages are received by different groups within the population.
46. To gain insight into the public's trust in science, UKRI has commissioned Ipsos MORI to monitor public opinion on science, scientists and scientific information during the COVID-19 pandemic. Through five fortnightly trackers, which are taking place across 20 weeks from April to August 2020, Ipsos MORI interviewed a representative sample of UK adults aged 16+. The polling suggests positivity towards science, with around six in 10 Britons saying they have trust in scientists in general. We have learned through the polling data, that overall, the public want more scientific information on COVID-19 – just 13 percent say there is too much. Major news broadcasters and the government remain by far the most common sources of scientific information on COVID-19.

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<sup>44</sup> <https://www.understandingsociety.ac.uk/>

<sup>45</sup> <https://coronavirusexplained.ukri.org/en/>

47. UKRI has also been determined to ensure the evidence is available to shape the domestic and international governmental and broader scientific response. Through AHRC, UKRI is funding a team to translate, compare and analyse the ways in which COVID-19 has been narrated around the world, to understand the effects of language misunderstanding and to offer significant insights into COVID-19's global narration.
48. UKRI has played a critical part in securing the dissemination of vital transdisciplinary scientific evidence across borders. As host of the Executive Secretary of the Global Research Council, UKRI has been instrumental in the creation of a joint COVID-19 statement encouraging openness in sharing research findings and data which will help ensure diagnostics, vaccines and prevention measures are developed rapidly for the benefit of every nation.
49. UKRI is also signatory to the Wellcome Trust-led statement<sup>46</sup> on sharing research data and findings relevant to the COVID-19 outbreak, calling on researchers, journals and funders to ensure that research findings and data relevant to this outbreak are shared rapidly and openly to inform the public health response and help save lives.

**Q7: The UK's readiness for future outbreaks, including a consideration of: The National Risk Register; the UK Pandemic Influenza Strategy; and PHE's Global Health and Infectious Diseases Strategy**

50. The UK's readiness for future outbreaks is a key priority issue that UKRI is addressing. Through long-term UKRI strategic and investigator-led support, the UK has world leading One Health capabilities and expertise in pathogen (viral, bacterial and fungal), parasite and vector biology relevant to emerging infections, and has led the development of interdisciplinary approaches able to understand the biological, environmental and social drivers of disease emergence, to better enable prevention at source.
51. UKRI-funded research, which will enable learning from the COVID-19 outbreak, includes University of Oxford research which will provide key insight to understand the spread and fatality rates of COVID-19 to inform future social distancing strategies. ESRC is in the process of setting up an international policy observatory which will compare other countries' policy approaches to the pandemic and share what the UK has learnt.
52. Next steps in priority setting for future outbreaks are already underway including:
  - The UK Collaborative on Development Research (UKCDR)<sup>47</sup> brings together major UK funders of global health research, and supports an Epidemics Preparedness and Response Group,<sup>48</sup> involving six UKRI councils (MRC, EPSRC, AHRC, BBSRC, ESRC and NERC), DHSC, DFID, Wellcome and the Academy of Medical Sciences. The Group is currently helping to coordinate UK research efforts against COVID-19, including through establishing an international database of COVID-19 research awards<sup>49</sup>. UKCDR's work on mapping awards against priority areas will help to identify gaps.
  - The MRC co-funds the Global Forum on bioethics in Research (GFBR) which is a partner in the PHEPREN Epidemic Ethics initiative led by the World Health Organisation. Through this initiative GFBR is contributing bioethics expertise, particularly focused on LMIC needs, to the

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<sup>46</sup> <https://wellcome.ac.uk/coronavirus-COVID-19/open-data>

<sup>47</sup> <https://www.ukcdr.org.uk/>

<sup>48</sup> <https://www.ukcdr.org.uk/about-us/our-groups/epidemics-preparedness-and-response-group/>

<sup>49</sup> <https://www.ukcdr.org.uk/funding-landscape/COVID-19-research-project-tracker/>

global epidemic response.

- UKRI, through BBSRC, is establishing an expert 'One Health Approach to Zoonoses Advisory Group' to work with UK government departments and devolved administrations to develop a national research and innovation framework for One Health approaches to (re)-emerging zoonotic diseases. The group will consider the UK's research capacity, capability and infrastructure requirements to respond effectively to (re)-emerging zoonoses and will unify the UK and global policy framework/structure to enable a One Health approach.

53. UKRI's strong and rapid response to the COVID-19 pandemic is founded on the world class research base we have in the UK and our strategic investments in relevant research. It is critical we learn from the gaps and opportunities which have been highlighted to ensure the UK has a coherent framework for future responses based on preparedness and resilience. This is necessary both in coping with R&D needs during the current pandemic and in preparedness for any future infectious diseases with pandemic potential. As mentioned above, UKRI is already reviewing the response to COVID-19, where emerging issues include the UK capacity for diagnostics and manufacturing, including the capability for rapid translation of research findings into practice. Continued support and investment are crucial to sustain and build upon research and innovation, providing the UK with the infrastructure, environment and culture required for the sector to thrive and build a greener, healthier and more resilient UK. We will be working with HM Treasury and with our sponsoring Department, BEIS, in the forthcoming Spending Review to ensure we have the future flexibilities to support our growth as a mature and agile steward of the R&D system.

***(July 2020)***